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ABSTRACT

In June 1986, the Federal Communications Commission (FCC) released its "Report and Order" and its "Third Computer Inquiry," which proposed to remove the then-current requirement that AT&T and the Bell Operating Companies (BOCs) provide enhanced services only through separate subsidiaries. Instead, AT&T and the BOCs would be subject to several nonstructural safeguards. The order continued the legal distinction between regulated basic telecommunications and unregulated enhanced communications, but it established two primary safeguards--cost accounting and improved interconnection--to replace the separate subsidiary requirement. This paper discusses two kinds of improved interconnection in relation to the FCC ruling: Comparably Efficient Interconnection (CEI) and implementation of an Open Network Architecture (ONA). The importance of open networks in communications regulation is described, and observations are made on the ONA process. Contentious issues in the ONA process--including confusion and distrust, uniformity, and state/federal conflict--and general conclusions on ONA are outlined. It is argued that the FCC ordered improved interconnection between the BOC networks and the enhanced services industry in order to better the public interest; that improved interconnection is a tool for achieving competitive equality between the BOCs and the enhanced service providers; and that the risk taken by the FCC with its ONA rules are slight compared to the potential reward. (GL)

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THE EVOLUTION OF ACCESS

by

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I. What is ONA?[1]

Three years ago, in mid-June 1986, the Federal Communications Commission (FCC) released its Report and Order[2] in its Third Computer Inquiry (CI-III). That order proposed to remove the then-current requirement that AT&T and the Bell Operating Companies (BOCs) provide enhanced services only through separate subsidiaries. Instead, AT&T and the BOCs would be subject to several nonstructural safeguards. The order continued the legal distinction between regulated basic telecommunications and unregulated enhanced communications, but it established two primary safeguards--cost accounting and improved interconnection[3]--to replace the separate subsidiary requirement. I won't say anything more today about cost accounting except that it should be clear to anyone familiar with public utility regulation that cost accounting is needed in this situation, and will prove to be a difficult and contentious issue in its own right.

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[1] This paper is an updated version of my September 1987 testimony on ONA before the House Subcommittee on Telecommunications and Finance. I would like to acknowledge the many helpful comments I received on an early draft of this work. In particular, the comments offered by Henry Geller of the Duke Washington Center, Jeanne Schaaf of Telenet, Kenneth Robinson of NTIA, Roger Burge of BellSouth and George Morlan of AT&T were especially helpful.

[2] FCC 86-252, FCC Report and Order In the Matters of: Amendment of Sections 64.702 of the Commissions Rules and Regulations (Third Computer Inquiry); and Policy and Rules Concerning Rates for Competitive Common Carrier Services and Facilities Authorizations Thereof, Communications Protocols Under Section 64.702 of the Commission's Rules and Regulations, FCC CC Docket No. 85-229.

[3] The FCC's rules also require carriers to disclose network information, regulate the use of customer information, and enforce non-discriminatory access to basic services.

The key point for today is that the FCC ordered improved interconnection between the BOC networks and the enhanced services industry in order to better serve the public interest. Improved interconnection is a tool for achieving competitive equality between the BOCs and the enhanced service providers. This improved interconnection is of two kinds: Comparably Efficient Interconnection (CEI) and implementation of an Open Network Architecture (ONA).

Let me briefly discuss CEI and then I will turn to ONA.

CEI. Comparably Efficient Interconnection (CEI) is an interim, ONA-like requirement. If AT&T or any BOC desires to offer an information service on an unseparated basis between now and when their ONA plan is approved, they must file a CEI plan which describes how they will offer firms competing with their enhanced service "equal access" to the transmission services used by their enhanced service. They cannot begin offering the enhanced service until their CEI plan has been approved and cost-accounting standards have been met.

The essence of CEI is that competitors and the BOC's enhanced service use the basic network on an equal footing. CEI is much like ONA, but it requires unbundling and equal access only to those communications services used by a carrier's enhanced service. In contrast, ONA is far broader since it requires unbundling of the network to meet the needs of enhanced service providers--whether or not the enhanced services of the BOC will ever use the elements of ONA.

It took a little less than a year from the time the FCC put forth the CEI requirement before any carrier filed a CEI plan. Several CEI plans have been approved.

ONA. Let me now try to describe ONA. The FCC's rules required each BOC to file an ONA plan by February 1, 1988. After an opportunity for public comment, the FCC will then approve, modify or disapprove the plan. Plans were filed by all seven RBOCs, comments received, and the FCC ordered the plans to be modified. Modified plans were

filed, comments received, and FCC action is expected within the next several months. FCC approval of a BOC's ONA plan is one of the preconditions to relief from structural separation.

These modified ONA plans describe how the carrier intends to unbundle its basic services into Basic Service Elements (BSEs) and Basic Serving Arrangements (BSAs). The FCC's rules are quite vague as to what constitutes a BSE. Indeed, a good part of the effort in developing ONA plans went into figuring out what the FCC meant by BSEs! These ONA plans also contain descriptions of the BOCs' ongoing procedures to develop additional BSEs in response to changing technology and changing demand.

BSEs will be tariffed services. The BOC enhanced service operations will obtain BSEs under tariff just like other customers.

Besides BSEs, there is another related concept, the BSA. The BSE was defined by the FCC in its Third Computer Inquiry order. Its concept is simple: a BSE is a part of a larger communications service which will be valuable to ESPs. Provision of Calling Number Identification or provision of Call Forwarding on Busy, for example, are natural basic service elements.

The RBOCs developed an additional concept: The Basic Serving Arrangement. BSEs are accessed by customers using BSAs. The concept is similar to call waiting. If one thinks of call waiting as a BSE, then ordinary local service is the BSA which gives a customer access to call waiting.

For example, if one does not have telephone service, it does not make much sense to order call waiting. In the same fashion, it does not make much sense to order Calling Number Delivery unless one has a communications link that will deliver the numbers. These communications links are the BSAs.

Although the Basic Service Arrangement is a simple concept, it has been overshadowed by its technological nomenclature. However, it was only a few years ago that "access service" and "LATAs" were similarly confusing terminology.

Quite frankly, most of the BSEs are technical and sound dull to the non-specialist.

The most valued BSE is automatic number identification (ANI). The local telephone network can be modified to transmit the telephone number of the calling party to the called party's computer (or telephone) at the beginning of a call, just as the local telephone network transmits this information to long-distance carriers today at the beginning of long-distance calls. It doesn't take much imagination to see how valuable this capability could be. I would certainly feel more secure if my bank would only accept telephone transfers which originated from my home telephone. The same security benefit probably applies to any high-value information service. But, this BSE will also bring some privacy concerns--depending upon how it was implemented and how it was explained to consumers. This BSE does not represent unbundling of the network, rather it involves adding new, valuable capabilities to the network.

II. BACKGROUND ON "OPEN ARCHITECTURES"

The FCC was not the first to use the term "open architecture." It has been used in a similar fashion in the computer and communications industry for the last decade.

Example 1: The OSI Model. The most prominent use of the "open" catchword was in the International Standards Organization's (ISO) development of the Open System Interconnect (OSI) model for digital communications (the ISO/OSI model). The Open Systems Interconnect model defined standard data communication interfaces which, if adopted by all manufacturers, would allow a DEC terminal to connect to an IBM mainframe or allow an IBM mainframe to send messages to a Honeywell mainframe. The standards were characterized as "open" to contrast them with the proprietary (closed) standards of the individual manufacturers. Development of the OSI model began in the mid-seventies. The ISO Basic Reference Model became an International Standard (ISO 7589) in the spring of

1983. They are widely referenced. Unfortunately, the OSI standards are complex and still incomplete, and systems from different manufacturers do not always work in harmony even though each manufacturer claims adherence to the OSI standard.

In fact, the issue of whether or not equipment conforms to the Open System Interconnect standards gave rise to a new organization, the Corporation for Open Systems (COS), which will test equipment to see that it meets open network standards.[4] COS is a membership organization. Its members include such firms as IBM, AT&T, PacTel, and National Semiconductor. But the very existence of the Corporation for Open Standards shows the widespread acceptance of the "open system" approach to communications standards.

Example 2: The IBM PC. The IBM PC, introduced in 1981, was widely characterized as having an "open architecture". Users could open up the box and plug in their own hardware. IBM made the hardware and software specifications for their equipment available at the same time they put the machine on sale. I think it's fair to say that IBM did almost everything it could to facilitate the provision of add-on hardware and software by other vendors. Some of these add-on hardware products, such as display controller boards, competed directly with IBM product offerings. Other add-on products, such as analog/digital converters or digitizing tablets, had no direct counterpart in IBM's product line.

IBM's open approach resulted in an avalanche of products compatible with the IBM PC including such famous products as the Lotus 1-2-3 software package. The availability of these add-on products, in turn, made the IBM PC a better buy and contributed substantially to the marketplace success of the IBM PC.

There was a down-side for IBM in its openness. They defined the standard so well and so clearly, using off-the-shelf building blocks, that it was relatively easy for competitors to build copy-cat or "clone" IBM PCs. Many firms are doing so today, and they have captured a major share of the IBM PC and compatible market.

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[4] See the special advertising section in Business Week, June 1, 1987, describing the Corporation for Open Systems.

IBM did not invent the concept of the open architecture. Many minicomputers provided such an environment as did the original Apple II (to a somewhat lesser degree). Other well-known personal computers, in particular the Apple Macintosh, were closed systems. Apple made some gains by keeping the Macintosh a closed system. For example, production costs were lowered since there was no need to protect users from hazardous voltages inside the case. A closed architecture also eliminated the competitive threat posed by clones.

More recently Apple has introduced updated versions of its Macintosh computer including one model known informally as the "open Mac."[5] It would appear that the benefits of offering customers open systems outweigh the disadvantages in some cases.

Example 3: Some examples in everyday life. I find it difficult to give examples of open and closed architectures outside the computer and communications industries. Most of the examples I come up with are forced similes, but they may help convey the concept.

1950s cars vs. 1980s cars. In the 1950s, a teenager could put a bigger carburetor on a car engine and add a 3/4 race camshaft, and obtain improved performance. In contrast,

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[5] Apple Computer Inc. is now running two-page magazine advertisements for its Macintosh II which are headlined "**Now open for business.**" Newsweek, July 27, 1987 between pp. 58 and 59.

See also the editorial "Open Systems" in the April 1987 issue of BYTE magazine. That editorial states in part:

> the trend toward open, flexible personal computers has become dominant once again . . . Since the Apple II world and the IBM PC have long had open architectures, the entire industry seems to recognize once again the need to let users upgrade their systems and adapt them for different applications. It is much easier to build in flexibility than to have 20/20 foresight about every owner's future needs.

most of today's cars have computer controlled carburization or fuel injection systems and associated emission control systems which make such modifications difficult or impossible.

Lego blocks vs. HO gauge trains. The popular Lego blocks used by many children are a closed system. Historically, Lego has protected its proprietary designs through patents and litigation. You cannot plug your Lego blocks into your Fisher-Price blocks or into your Tinkertoys.[6] In contrast, all HO scale model trains run on the same scale tracks. You can mix trains of one manufacturer with trains of another on the same set of tracks. HO trains provide an open architecture.

The essence of an open architecture is freedom--the user is free to choose which parts to use to build a complete system. Users are able to combine part X from vendor A and part Y from vendor B, plug them together and have a system that works. Even if vendor A has a monopoly on product X (due say to patent rights), he or she cannot transfer that monopoly to the market for product Y, since the user can plug product X into any manufacturer's product Y. The standard, open architecture interface between product X and product Y eliminates[7] the possibility for the transfer of the monopoly. In antitrust terms, technological forcing of tying sales is eliminated. Market power cannot be easily transferred from one product to another.

Open Architecture and the FCC's Third Computer Inquiry. Four years ago,[8] the FCC began its Third Computer Inquiry (CI-III). They were searching for a substitute to the structural barriers they had placed on the provision of enhanced telecommunications services by local telephone companies. At the same time they wanted to retain safeguards which would prevent cross-subsidy or anti-competitive conduct by the local telephone

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[6] Some firms now offer Lego compatible blocks, but they are the subject of litigation.

[7] Eliminates may be too strong a term here. Perhaps one should say "substantially reduces and may eliminate."

[8] Third Computer Inquiry CC Docket 85-229 by NPRM [FCC 85-397] rel. August 16, 1985.

companies from damaging competitors and thereby denying the customers access to better service or lower prices.

In their notice, the FCC put forward the concept of Comparably Efficient Interconnection (CEI), an unwieldy phrase which they used to refer to the concept that a telephone company should give competitive enhanced service providers access to basic communications services which is about the same as the telephone company uses for its own enhanced services. CEI was not the centerpiece of the Commission's notice, it was one of many ideas put forward.

However, the U.S. Department of Justice took that idea and expanded upon it in their comments to the FCC on Computer III. To quote them:

> The public interest would best be served by Commission efforts to condition provision of ancillary services[9] by carriers controlling bottleneck monopolies on such carriers' affording other providers of ancillary services with the same interconnection to the bottleneck that the dominant carrier provides itself. To the extent **network open architecture** can put all ancillary service providers, including the dominant carrier, on an equal footing, accounting tools and non-discrimination rules may be sufficient to protect against anticompetitive abuses. By limiting the bottleneck monopoly in this manner, the Commission can rely on technology rather than direct governmental regulation to promote competition in the most cost efficient manner.[10]

Looking back, it seems clear that U.S. Department of Justice was extrapolating from their generally successful experience with equal access for long-distance[11] to the enhanced

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[9] U.S. Department of Justice is using "ancillary services" to refer to enhanced services and terminal equipment.

[10] Comments of the United States Department of Justice in FCC CC Docket No. 85-229 at 2. (Emphasis added) Note that they use the phrase "network open architecture" a closer tie to the pre-existing "open architecture" concept than the alternative phrase "open network architecture."

[11] I am thankful to Kevin Sullivan, who was Assistant Chief of the Communications and Finance Section of the Antitrust Division of the Department of Justice (continued...)

services market. If they could find an analog of equal access for information services, then the bottleneck would be circumvented. Network open architecture was to be equal access for information services.

Similarly, in comments filed the same day, US West strongly urged the FCC to adopt "Open Network Architecture" as the linchpin of its telecommunications policy. US West used the term "open network architecture" in quotes to refer to their concept.[12] Ameritech filed comments describing their concept of a Feature Node/Service Interface (FN/SI) which contained similar ideas.[13]

While there were suggestions of concepts[14] similar to ONA floating around at the time of the U.S. Department of Justice, US West, and Ameritech filings, those filings seemed to crystallize those ideas into one well formed regulatory proposal. After the filings, the ONA concept received careful attention in the industry and by the regulators.

III. Open Networks in Communications Regulation

Why are open networks so important? Why have they become an issue today? In the discussion below, I look first at some of the underlying economic theory which argues for open network approaches to regulation. I then turn to the historical use of mandatory interconnection as a regulatory tool in telecommunications in this country. My purpose in this section is to show that open networks are a sensible public policy reaction to a real

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[11](...continued)
at the time DOJ's Comments were filed in CI-III, and to Richard Levine who was also with the Department of Justice just prior to the beginning of CI-III for an explanation of the development of DOJ's position on CI-III.

[12] See Comments of US West, Inc., in FCC CC Docket No. 85-229 (Third Computer Inquiry) at v.

[13] See Comments of the Ameritech Operating Companies, in FCC CC Docket No. 85-229 (Third Computer Inquiry).

[14] The FCC's own CEI proposal was one. Ameritech's Feature Node/Service Interface (FNSI) concept had been discussed publicly before the filing date.

problem, and that the FCC's current ONA policy is just the latest in a long line of similar policies which this nation has adopted.

Monopolies from Consumption Externalities. There is much discussion of natural monopolies in telecommunications. Generally, a firm is described as a natural monopoly if there are economies of scale--that is, if the more subscribers the telephone company has, the lower the costs per subscriber.[15] The existence of natural monopoly is used to justify much regulation.

But, for the sake of discussion, consider a hypothetical telephone technology which exhibits no economies of scale--with this technology it costs exactly ten times as much to service 100,000 subscribers as to service 10,000 subscribers. Now, consider two firms offering competing telephone service in a town with a population of 100,000. Assume that one firm has a 60 percent market share, the other a 40 percent market share, that they each charge the same for telephone service, and that the systems are not interconnected. If the town is strongly polarized--if none of the 60 percent want to talk to the 40 percent and vice versa, then two firms can coexist in a stable equilibrium.

In contrast, if everybody in town likes to talk to everyone else equally well, then this situation is not stable at all. Rather, customers will desert the smaller telephone company and move to the larger because it gives them access to a larger group of co-subscribers. In economists' jargon, the externalities created by other subscribers to the telephone company

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[15] More sophisticated definitions of natural monopoly rely on sub-additivity of the cost function over the feasible set of potential subscribers, etc. It all comes to the same thing: one firm is cheaper than two.

have created an economy of scale on the demand side.[16] In non-economists terms, the bigger network wins in the market place even if its costs are higher.[17]

Similar phenomena occur with other products where purchase decisions of one consumer affect the value of the product to other consumers. For example, there are two videocassette standards, VHS and Beta. It appears that VHS is outselling Beta, and that, in response, movie rental stores are beginning to stock more titles in VHS than in Beta. Thus, consumers who want access to the largest choice in movies at the rental store will buy VHS machines. Each additional purchaser of a VHS machine increases the value of choosing VHS to the next purchaser. Terms such as "critical mass" and "bandwagon effect" are used in the economic literature to refer to the likely success of the network or standard with the larger market share.

Interconnection as a Cure for this Monopoly Problem. In the case of our two hypothetical telephone companies, the argument would be drastically changed if technology allowed for easy, low cost interconnection of the two systems. If the systems were interconnected, a subscriber to the system with 40 percent of the market would not need to switch to the other system in order to call its subscribers. Now, a firm with a 60 percent market share may not wish to interconnect with a firm with a 40 percent share. The larger firm may just wish to let the market operate.

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[16] The seminal paper describing the effect of consumption externalities on subscribership to telecommunications services is Jeffrey Rohlfs, "A Theory of Interdependent Demand for a Communications Service," The Bell Journal of Economics and Management Science, Vol. 5, No. 1, Spring 1974. For a discussion of some of the same issues in the context of choosing technical standards, see Besen and Johnson, Compatibility Standards, Competition and Innovation in the Broadcasting Industry, R-3453-NSF, The RAND Corporation, November 1986, and Besen and Saloner, Compatibility Standards and the Market for Telecommunications Services. Paper presented at the Brookings Institution conference on Technology and Government Policy in Computers and Communication, June 1987. See also the references cited in Besen and Johnson, and in Besen and Saloner.

[17] As long as its costs are not so much higher that they wipe out the positive externalities.

Of course, under these conditions,[18] the public will soon have to deal with the problems created by having a single telephone system. Public utility regulation of the monopoly provider may then be attractive. But, if society chooses to require mandatory interconnection, the two telephone firms will compete, there need not be any collapse of the industry to a single firm, and no need for public utility regulation. Notice that regulation is not eliminated in this example, rather a simple form of regulation substitutes for a complex form. It is far easier to believe that regulators can insure that two telephone companies exchange traffic, than to believe that regulators can set prices efficiently or can calculate fair rates-of-return with precision.

Actual Use of Interconnection as a Regulatory Tool. Historically, we chose to regulate local telephone companies as public utilities rather than merely force them to interconnect with local competitors.[19] I suspect that, in the days of manual operators, interconnection was expensive and inefficient--a call which had to go through two operators would be significantly less convenient than a call completed by a single operator. Thus, 50 or 80 years ago, mandatory interconnection may not have been technically acceptable as a regulatory solution.

While mandatory interconnection of local systems faded away with duplicative local telephone systems, AT&T had agreed to interconnection between its long-distance network and the local systems of independents in the famous Kingsbury Commitment of 1913. The

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[18] No interconnection of carriers, substantial consumption externalities, and a lack of stratification in the community.

[19] Vietor reports that 26 states enacted laws between 1907 and 1913 requiring interconnection. Richard H.K. Vietor, AT&T and the Public Good: Regulation and Competition in Telecommunications, 1910-1987, Harvard Business School, Division of Research, 1987 at 7. Walker reports that, by 1919, 34 states had enacted laws requiring physical interconnection of telephone companies. Paul A. Walker, Proposed Report Telephone Investigation, (Walker Report), U.S.G.P.O., 1938, at 153. These references do not make it clear whether it was interconnection of competing local exchanges that was required or if the required interconnection was of adjacent local exchanges or of long-distance carriers to all local carriers.

Communications Act of 1934 authorizes the FCC to order interconnection between carriers when it finds such interconnection in the public interest.[20]

Starting in about 1950, in a series of FCC proceedings, the regulators began to require interconnection of the local telephone network to competitive equipment and networks. In most of these cases, interconnection was required for its own direct benefits, not as an substitute for public utility regulation.

But, if we look at terminal equipment, we see mandatory interconnection leading to reduced regulation. The sequence was:

- Carterfone (1968)
- The Registration Program (1975)
- Computer Inquiry II (1980)
- Divestiture (1984).

With its Carterfone decision, the FCC opened the door to a competitive market for terminal equipment. In 1975, the FCC established a scheme for allowing competitively provided terminal equipment to be attached to the telephone network easily, and on an equal basis with terminal equipment provided by carriers. By 1980, they were able to order that, henceforth, essentially all new terminal equipment was to be provided in the competitive marketplace and outside economic regulation. The technical regulation of the FCC's registration program was maintained, as were the safeguards of Computer Inquiry II which restricted the actions of the Bell System companies. After the Modified Final Judgment (MFJ) in the AT&T antitrust suit was announced, the FCC modified its rules so that all the embedded terminal equipment of the Bell System would be deregulated at divestiture.[21] By the standards we apply to regulatory actions, the FCC terminal equipment registration program

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[20] See 47 USC 201.

[21] See Report and Order, In the Matter of Procedures for Implementing the Detariffing of Customer Premises Equipment and Enhanced Services (Second Computer Inquiry), 95 F.C.C.2d 1276.

was a raving success! It facilitated competition, it reduced direct economic regulation, and complaints about the program are minimal today.

Similarly, the FCC has used mandatory interconnection and removal of restrictions on the use of interconnected circuits in other proceedings[22] to limit monopoly power. In the long-distance market we saw a gradual evolution from allowing competitive long-distance carriers to use local loops for private line services to the full equal access required by the MFJ. It is only fair to point out that there is still vast confusion and controversy over both the effectiveness of equal access in creating a competitive long-distance market and whether or not the benefits of the rapid transition to equal access were worth the cost.

Congress has used mandatory interconnection as a tool when allowing competition. The Record Carrier Competition Act of 1981[23] allowed domestic record carriers to provide international record service also, but it required record carriers to interconnect with one another for a limited time, and it also required domestic record carriers[24] to provide equal access to all international record carriers--equal to the access provided to their own international operations.

Information Services. The history of interconnection in information services differs significantly from the above examples of carrier interconnection. In the early days of computer-based information services (the 1960s), computers plugged into network just like a telephone, and the rules governing CPE controlled operations. In Computer Inquiry I, the FCC required "maximum separation" between the regulated network and computer services.

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[22] For two recent examples see the FCC's resale decision, Resale and Shared Use, 60 F.C.C.2d 588 (1977), or its cellular decision which mandated interconnection of the cellular carriers with the local wireline exchange and required resale of cellular service. Inquiry Into the Use of Certain Frequency Bands for Cellular Communications Systems; and Amendment of Rules Relative to Cellular Communications Systems, 46 F.R. 27655 (1981).

[23] See Public Law 97-130, 95 Stat. 1687-90, Dec. 29, 1981 or 47 USC 222.

[24] This only applied to carriers with a significant market share.

At this time there was little evidence of network-based information services beyond time and weather.

Network-based information services did develop in the 1970s (e.g., Dial-a-Joke, Custom Calling II, 900 service). Computer Inquiry II outlawed provision of Custom Calling II and Dial-a-Joke in the regulated network and the information services prohibition of the MFJ outlawed the BOCs' provision of services relying on voice storage technology whether those services were provided inside the network or through separate subsidiaries.

Dial-a-Joke was reborn as 976 service. In the customary arrangement, 976 calls are made to a number such as 976-XXXX. The information service provider's recording machine answers the call and supplies a pre-recorded message, e.g., a joke. The telephone company bills the customer, keeps some of the money, and sends the rest to the information service provider. The 976 service has opened up the information service market--a far wider variety of recorded message services are available today than were available before divestiture. But, in the view of many, there have also been misuses of the capability. Among the most prominent uses of 976 are for "adult" services and "children's" services.[25]

I believe that, at the time of Computer Inquiry I, technology neither allowed nor required integration of information services with the telephone network. But, since then there has been an enormous fall in the cost of electronics. It's hard to define that fall since new technology is used in ways which just were not possible 20 years ago. But, it seems fair to say that costs of electronics have fallen by a factor of 100 to 1,000 between the beginning of Computer Inquiry I and today.

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[25] One December, my then four year old daughter, Ann, came home, held out a piece of paper, and proudly announced that she had Santa Claus' phone number. Sure enough, the first three digits were 976! She knew how to call Santa, she just didn't know that it cost 50 cents per call.

We can confidently expect that the costs of electronics will continue to fall.[26] The enormous continuing fall in the cost of computation and storage has changed the stakes in telecommunications regulation. When computers were expensive, regulatory rules and industry practices which raised costs by a few percent created little harm. But, with the change in the price of electronics, that same amount may now be the dominant system cost!

One way to think of this changed regulatory problem is to ask what would be the proper regulation of information services if computers were free? After all, if computers were free, would we be concerned that BOCs would cross-subsidize their purchase? Modern low-cost electronics make it possible to place information processing functions in the telephone network at little cost. Indeed, the evolution of processing capabilities makes it almost imperative that functions which were once regarded as information processing be built into the telecommunications network.[27]

Summing Up. Open architectures are a well understood approach to limiting market power. Over the last few decades we have begun to use mandatory interconnection as a regulatory tool, complementing traditional public utility regulation. In some circumstances, it has successfully allowed for a reduction in direct economic regulation (PBXs are not in the rate base anymore). At the same time, we have reached the point where information processing has become so inexpensive that it can naturally be built into the telephone network.[28] This implies that the costs (in benefits foregone) of the separate

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[26] For a recent discussion of future possibilities, see Myers, Yu and House, "Microprocessor Technology Trends," Proceedings of the IEEE, Vol. 74, No. 12 (December 1986) at 1605-1622.

[27] For example, modern microprocessors allow use of error-correcting protocols on data links at very low cost. Such protocols are now widely used today. Some are implemented by CPE, others are provided by equipment inside the network. Current ISDN standards require widespread use of such processing, and to my knowledge, no party has objected to this element of ISDN plans.

[28] When information processing was much more expensive than today, it made economic sense to spend money on telecommunications if that made the use of computing more efficient. With today's costs of information processing, it makes sense to use information processing to make telecommunications more efficient.

subsidiary requirement of the Computer Inquiry II rules have increased--indeed in the FCC's judgment they have become intolerable. Thus, we need a new safeguard.

ONA is well matched to our times. ONA fits the historical trend to interconnection-based regulation, and it may allow integrated provision of information services without abuses. ONA lacks the simplicity of terminal equipment interconnection, however. It is far more difficult to specify an ONA plan, than to specify the minimal rules needed to govern terminal equipment interconnection.[29] Thus, while ONA appears well placed in its historical context that is not enough to insure that it will be successful.

IV. Observations on ONA Process

Let me share with you a few observations on the ONA process.

Definitions. First, the definition of ONA is vague--far less precise than the equal access requirements of the MFJ or the requirements of the FCC's CPE registration program. This vagueness creates two problems which are really two sides of the same coin. It has been and will be difficult for telephone companies and regulators to tell if a specific ONA plan fully conforms to the rules. It creates the opportunity for petitioners to continually ask for more, since they can plausibly argue that any specific plan is lacking in one or another possible aspect. It creates an environment where contention and strife are natural. This contention may overshadow any successes of the ONA approach to regulation.

Start-Up Problems. Second, both RBOCs and the enhanced service provider/user community appear to have found the ONA process difficult at the beginning. The BOCs faced an obligation to develop and file an ONA plan by February 1, 1988. Yet, the FCC's rules hardly specified what they should put in their ONA plans. Instead, the FCC set broad goals and directed the RBOCs to file ONA plans which meet those goals. Necessarily, the

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[29] Basically the FCC's rules do two things. They require that all terminal equipment be designed to prevent harm to the network and they require carriers to notify manufacturers and users of their interface standards. The FCC rules do not actually specify those interfaces or the signalling protocols used over the interfaces.

RBOCs began in the dark and first had to invent a few candles before they could go looking for ONA plans.

Those who will use ONA services, the enhanced service providers and the large users, faced a similar problem of trying to understand what services the telephone company can provide. In a study we did for Bell Atlantic of user needs, we came across these phenomenon several times. As one interviewee put it:

> "We have always regarded the telephone network as a given, like the laws of physics. It's an interesting idea to think how it might be changed to allow us or our customers to provide better service, but it's not something I have ever thought much about. I'll have to give it more thought before I can respond."

In the three years since, the FCC's ONA order both the RBOCs and the user communities have thought hard about their capabilities and needs in a systematic fashion, and there is less confusion today than there was at the beginning.

A Major Short-Run Benefit. Third, I believe that the biggest short-run benefit of ONA is that it has forced the BOCs to systematically examine the needs of the enhanced service providers market in an environment where all the old corporate and regulatory rules were questioned. Some have criticized the marketing orientation of much of the RBOCs' exploration of ONA services. Yet, in my opinion, this is one of the biggest benefits of ONA. The RBOCs are looking at the needs of an important class of users, the enhanced service providers, and are asking:

> How do we serve these users better? How do we best give them the ONA BSEs which they need and we are obligated to give to them under the FCC's rules?

In considering this question, the RBOC market analyst is far less fettered by old regulatory rules or existing corporate policies than is the case in the normal, day-to-day

market analysis. I believe that we will see substantial benefits from this wide-open examination of service needs.

Changed Incentives for the BOCs. The ONA rules changed the BOCs incentives. In the past, they had little incentive to either understand the enhanced services industry, or to craft special arrangements to serve that industry better. Indeed, to the extent that serving the enhanced industry more efficiently meant losing sales of old-fashioned network services, their incentive was not to rock the boat. Today, the BOCs face both a carrot and a stick. The carrot is the opportunity to make money in the enhanced services marketplace. This carrot will cause the BOCs to work harder to understand the enhanced services market and to understand how improvements in local exchange service can aid enhanced service providers. The stick is the FCC's requirement that the BOCs must develop broad general ONA plans, which call for improving interconnection for all enhanced services -- not just those which the BOC will compete against.

V. Contentious Issues in the ONA Process

Confusion and Distrust. The early difficulties in the ONA process which I mentioned above, together with the natural communications problems between differing, sometimes competitive firms, led to what might be characterized as an atmosphere of confusion and distrust between the RBOCs and some in the enhanced service provider community.

Uniformity. There is a clear conflict between national uniformity and regional autonomy. In our interviews and workshops, to the best of my recollection, **all** firms which did business in more than one region expressed a strong preference for nationwide uniformity of ONA services. Generally they were not asking for uniform prices,[20] but uniform definition of services and uniform availability of services. Each ONA service would be available in every region with the same name and the same technical characteristics. This same

[20] One of our subjects actually did request nationwide price uniformity.

preference has been expressed at the national ONA forums and in statements by user groups.[31]

Concern for national uniformity is understandable. Users and manufacturers operating in national markets would benefit substantially from uniformity. Yet the FCC's ONA rules apply to seven RBOCs operating in 48 states and do not apply to non-Bell telephone companies.[32] Clearly, any firm using ONA services nationwide should be concerned about national uniformity. However, guaranteed uniformity was lost with the AT&T divestiture.

I personally feel that the concern for uniformity is overblown. One of the benefits of divestiture is benchmark competition among the RBOCs. Forcing uniformity on ONA plans wipes out the gains of such benchmark competition in the ONA world at a stage in the process where this competition can be most beneficial in "fleshing out" the ONA concept. Additionally, I expect that market forces (in particular, the fact that telecommunications equipment manufacturers such as AT&T and Northern Telecom offer products to nationwide and worldwide markets) and the fact that standardized ONA BSEs will sell better than differentiated BSEs create strong forces for national uniformity. I would also observe that the RBOCs, in response to the concern for uniformity, have committed themselves to achieving substantial national uniformity.[33] I doubt that any regulatory intervention to assure uniformity is necessary or desirable at this time. If a lack of uniformity turns out to be a problem, the regulators can always intervene later.

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[31] See the proposal dated July 16, 1987 by the Coalition of Open Network Architecture Parties (CONAP), a group of user organizations. That proposal contains nine ONA principals--the first of which is national uniformity.

[32] The FCC has not ruled out applying the ONA rules to non-Bell companies at some time in the future. See the Computer III order at para. 132.

[33] For example, see page 4 of the June 30, 1987 letter from J. J. Appel and S. M. Harris of Pacific Bell to Mark Golden of the Association of Telemessaging Services International or July 8, 1987 letter from G. Marble of Bell Atlantic to J. S. Blaszak of the Ad Hoc Telecommunications Users Committee. These letters promise to work towards national uniformity.

State/Federal Conflict. There is one area of special concern to me which could determine the ultimate success or failure of the entire ONA process. The FCC's Computer Inquiry III rules require the Bell Operating Companies to offer a host of new services--the ONA BSEs and any services needed for CEI--most of which will be offered in state jurisdictions. This requirement alone creates a conflict, since state regulators may feel that the very existence of certain BSEs distort the pricing structure they have developed over the years and that the authority to order new local services properly rests with local regulators. But, the FCC has also inserted itself into local ratemaking. Paragraphs 167 through 186 of the FCC's Computer Inquiry III order discuss the proper principles for pricing CEI/ONA services and set forth standards governing such pricing. Additionally, Mark Fowler, former chairman of the FCC, co-authored a law review article[34] which called for removing rate and rate-of-return regulation on local exchange carriers if those carriers were subject to an Open Network Architecture.[35] Naturally enough, some state regulatory authorities have demurred[36] from this expansive view, and, given the circumstances, it would be natural for state regulators to suspect that the FCC's agenda for ONA goes far beyond merely assuring a level playing field for all enhanced service providers.

The conflict between state and federal authority is real, not merely hypothetical. When CEI plans are filed at the FCC, local rate issues are considered first at the FCC before they being presented to state regulators.

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[34] Fowler, Halprin and Schlicting, "Back to the Future": A Model for Telecommunications," 38 Fed. Comm. L. J. 145 (1986).

[35] Ibid. at 195.

[36] See the article by Vial and Dumas, Gone with the Wind: a State Regulator' View, Telecommunications, January 1987, p. 94. Mr. Vial is a member of the California PUC and Ms. Dumas is Counsel for the CPUC. Note also that NARUC adopted a resolution at their convention which expressed their concern at possible federal overreaching (although they were polite enough to avoid using the term "overreaching").

Similarly, a group representing some large firms interested in ONA submitted a proposal on ONA principles to the FCC and to the RBOCs.[37] That proposal states that

> BSE rates should be set on the basis of cost as determined in accordance with appropriate regulatory costing methods and without supercompetitive prices and profits to the BOCs.
> CONAP Proposal at 5, emphasis in original.

It appears to me that the CONAP parties want the FCC to dictate to the states the proper pricing of local exchange services. They appear to be asking that BSE rates not embody any cross-subsidies from their members to the small business or residential ratepayer. Such subsidies may be good or bad public policy, but they are **local** ratemaking issues, and in our federal system and under current law, should not be issues before the FCC. If there is one part of the ONA process where Congressional attention and perhaps even action is needed today, it is the clear definition of the State/Federal boundary.

VI. ONA IN OTHER JURISDICTIONS

Other regulators have adopted ONA-like programs. Most prominent among them are several states including Maine, New York, and Florida, which have created state ONA plans. These state programs have all used the term ONA to refer to their activities.

In Europe, the Commission of the European Communities, published a "Green Paper on the Development of the Common Market for Telecommunications Service and Equipment" in June 1987 which set forth several recommendations[38] for the telecommunications industry in the member states of the European Community. Among these recommendations was one for "Open Network Provision." Open network provision contemplates aiding the value-added industry in europe through (1) the development of standard technical interfaces, (2) the unbundling of the costs of "bearer" services and "value added" services, and (3) the restriction

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[37] See CONAP proposal at n. 30 above.

[38] The general tone of these recommendations was to allow a greater role of market forces, to create pan-european standards and market structures, and to facilitate communications inside the european community.

of resellers from offering basic voice telephony. While their chosen term is "Open Network Provision," they also use the term "open network access"[39] at one point to refer to the same concept. It is also clear that the authors of the Green Paper were aware of the FCC's ONA policy since they discuss it on page 164 and in Appendix 1.

The Commission's proposal on this point was

> Working out in common the principles of the provision of the network to competitive service providers is a necessary requirement for a Community-wide competitive market for terminal equipment and for competitive services, including in particular value-added services, if a long period of case-to-case decisions is to be avoided.
>
> This concerns in particular the definition of clear Europe-wide network termination points, usage conditions and tariff principles and availability of frequencies where relevant.

The Commission has also developed and revised a proposal for implementation of ONP.[40] This proposal makes it clear that a major goal of the European ONP is to foster a uniform market for telecommunications throughout Europe, to restrict the monopoly operations of telecommunications organizations to as small a range of economic activity as possible, and to enlarge the role of competition. In american terms, ONP rolls together the computer inquiries, the resale and shared use docket, and other FCC proceedings that were part of the deregulatory movement.

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[39] Green Paper, p. 112. One must notice that the Europeans have done the better job in choosing terminology. Calling the FCC's plan an "Open Network Access" plan or an "Open Network Provisioning" plan would have more closely reflected their intent. However, as discussed above, the term "Open Network Architecture" was closer to the widely used "Open Architecture."

[40] See "Proposal for a Council Directive on the establishment of the internal market for telecommunications services through the implementation of Open Network Provision (ONP)", Commission of the European Communities, Brussels, 9 January 1989 and "Revised Proposal for a Council Directive on the establishment of the internal market for telecommunications services through the implementation of Open Network Provision (ONP)", Commission of the European Communities, Brussels, 10 August 1989.

VII. CONCLUSIONS ON ONA

Let me offer you a few of my own personal conclusions on ONA.

First, so far it appears to have been a beneficial process. The additional attention it has forced the BOCs to pay to their enhanced service provider customers and, equally important, the special circumstances of the ONA service development process have allowed the needs of the enhanced service providers to be considered outside the normal regulatory and organizational constraints governing marketing efforts at the BOCs. The ONA process will cause the BOCs to become better suppliers to the enhanced services industry and will benefit both the enhanced services providers and their customers.

Second, I believe that--as was the case with terminal equipment interconnection and long-distance equal access--ONA and CEI provides significant safeguards against potential BOC abuse of their control of the local network while allowing the BOCs to provide some enhanced communications services as part of their network. That is, I believe ONA and CEI allow the BOCs to compete fairly in the enhanced services market. It is too early to be sure that this is the case, but we can find out only if we go forward.

The collision between the FCC's ONA rules and state regulation is unfortunate. If any single force can derail ONA, it would be concerted opposition from the state regulators.

ONA appears to fit the times. The FCC is relaxing a bar on the BOC provision of enhanced services in the network--a bar which makes little sense given the state of today's technology--and in return is requiring a form of "equal access." This approach to regulation matches our recent experience in many areas--from terminal equipment to international record service. Unfortunately, ONA is more difficult to achieve than our earlier forms of equal access. One can imagine that the ONA proceedings will degenerate into a never ending cycle of pleadings where special interests try to wrest new services--or old services in new packages with lower prices--from the BOCs using the FCC's ONA rules as their crowbar. The FCC is taking a risk with its ONA rules, but, in my judgment, the risks are slight compared to the potential reward.